

ON SOME PHOTOGRAPHS OF LIGHTNING FLASHES.

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THE photographing of lightning flashes, it may be stated at the outset, is no new thing. Many successful photos of flashes have been obtained since the introduction of the Rapid Dry Plate Process now so universally used, and some of these, having come under the notice of the Royal Meteorological Society, the Society deemed the matter of so much importance that a Thunderstorm Committee was formed last year for the purpose of collecting and reporting on such photographs. Circulars were sent out inviting specimens, with a request to all amateur and professional photographers to assist the Committee. The process is simple. A camera focussed for long distance objects is pointed in the direction whence the flashes proceed, the carrier slide is withdrawn and the lens uncovered for a time. It is advisable to remain on the watch and cover the lens after the appearance of a flash in the field of view, and then to expose a fresh plate. A series of flashes on one plate, though it might make a more effective picture, would not lend itself so readily to scientific investigation.

On the evening of July 30th last, I took advantage of the thunderstorm that then occurred to expose a series of plates. The most open view from my residence is in the direction of the Cape Flats, and in that direction bright flashes, or sparks, to use a better term, were frequently appearing. Care was taken to get only one flash on each plate, with the result that the larger proportion were failures, but on several plates I obtained images which I pass round. Though inferior and disappointing compared with the others to which I draw your attention, such as this photo obtained by Mr. Hawksworth in Natal, and particularly this fine photo obtained in Cape Town by Mr. Allis about a twelvemonth ago, they are of some interest, I venture to hope, in elucidating and amending the report just issued by the Thunderstorm Committee already referred to. I wish particularly to draw attention to the fact that the sky was almost covered with clouds of varying thickness; this not only rendered some of the

sparks too feeble to impress themselves on the plate, but cut off parts of others, thinned their images in some places, and it may be assumed with considerable certainty showed that the images that were obtained were only such parts of the flashes or sparks as were visible through and between the cloud masses. Before referring to their main features let me draw attention briefly to the recent report of the Meteorological Society's Committee, drawn up by the Hon. Ralph Abercromby.

The Committee reports that from the consideration of sixty photographs sent from Europe and America in answer to their circular, "it is evident that lightning assumes various typical forms, under conditions which are at present unknown." The following appear to be some of the most typical forms :

1. *Stream Lightning*, or a plain broad, rather smooth streak of light. Only two or three specimens of this form were received by the Committee.

2. "*Sinuuous Lightning*, when the flash keeps in some one general direction, but the line is sinuous, bending from side to side in a very irregular manner. This is by far the commonest type." It is very noticeable that the thickness of the line varies during the course of discharge. Sometimes the thinnest part is the highest, at other times a flash in the air begins thin, broadens out in the middle and thins again on approaching the earth. The Committee says that it can offer no explanation of this at present, but draws attention to the fact in some photographs of electric sparks taken from an induction coil, those of high tension are thinner than those of low tension. This, I venture to think, affords no explanation of variation in intensity during the course of one flash, though it may explain the variation in thickness between two flashes.

3. *Ramified Lightning*, in which part of the flashes appears to branch off from or run into the main streak like the fibres from the root of a tree.

4. *Meandering Lightning* ; sometimes the flash appears to meander about in the air without any definite course and forms small irregular loops. The thickness of the same flash may vary considerably in different parts of the course, as above mentioned.

5. *Beaded or Chapletted Lightning* ; sometimes a series of bright beads appear in the general white streak on the photograph. Occasionally these brighter spots appear to coincide with bends in a meandering type ; but often the beads appear without any evident

looping of the flash. The Committee goes on to point out, what is also plainly evident in the beaded appearance in the photographs which I have taken myself, that it is evidently due to the flash taking at times a course to and from the observer and giving a longer exposure to these spots.

6. *Ribbon Lightning*. "Nearly one-sixth of the photos received by the Society show flashes exhibiting more or less of a ribbonlike form. One edge of the ribbon is usually much whiter and firmer than the other." The Committee points out that this form is probably due to double image formed by internal reflections of doublet lenses. This defect then, if it is only a defect, is visible in my own photos, more particularly in those parts of the flash nearest the edges of the plate. My experiments were made with a doublet lens, as at the time they were taken the report I quote was not published and I was not aware that a single lens gave the best results.

Of these various forms I pass round illustration and draw attention to the diagrams on the wall which are roughly copied from specimens issued with the report.

The beaded appearance in my plates I have already drawn attention to. Apart from this they might be classed as sinuous, meandering, or as ramified, as they partake more or less of all three characters. I have already mentioned the clouded condition of the sky and I need not add that clouds must necessarily be present where lightning discharges take place. The Committee have singularly enough overlooked this, the simplest explanation of the variation in thickness of a flash. Cannot the cutting off of parts of a flash by cloud, and modification of the other parts of absorption through cloud, explain some of these forms assumed by lightning flashes?

Let me draw your attention to two diagrams roughly copied from photographs of the electric spark taken by Mr. Trueman Wood, of the Society of Arts, with a large induction coil.

Here is a single spark which obviously corresponds with Class 1 or Stream Lightning. The next is the result of six successive sparks impressed on the plate. By covering portions of this photograph we can get tolerably near approaches to the sinuous, ramified, and meandering types. The beaded type, which is readily explained, has been obtained by Mr. Wimshurst with a large electrical influence machine.

In a thunderstorm, as terminals of the natural electric machine we have not one only but sometimes many points of discharge, in the

irregular form of the clouds, when it is from cloud to cloud, and also when from cloud to earth, the earth may present various points also, rather than simply one terminal. The discharge, whether in many simultaneous or many successive sparks must necessarily be very complicated, but still of the character shown by the six sparks in the diagram. The masses of cloud obstructing parts of this complication of sparks appear to my mind to afford sufficient explanation of the various forms of lightning shown in the photographs.

To sum up. It appears probable then, that so far from lightning assuming various forms under conditions at present unknown, it only assumes two forms such as may be obtained in the laboratory, the single spark and the compound flash or series of sparks; the various forms of the latter being due to modification in appearance by the obstruction of cloud masses. Bearing in mind that the former view is put forward by one of our best living representatives of Meteorological Science, I put forward a contrary view with all due diffidence, but in apology for my presumption I lay stress on the fact that my own view is based on photographs taken by myself coupled with personal observation of the condition of sky at the time, whereas the view taken in the Meteorological Society's report is based on an examination of photos taken by others. In their circular the Meteorological Society only asked for the photographs. Had they ventured to ask photographers for particulars, were it only a general description of the sky, though they might have found fewer correspondents to communicate with them, I venture to think that the Committee would have adopted views similar to my own.

Photographers in other parts of the Colony have better opportunities of recording thunderstorm phenomena than we have here. If their attention is drawn to the fact that by a little trouble on their part they may get results not only interesting in themselves, but of importance in investigating phenomena which cannot be studied without the use of the camera, they will doubtless join in furthering the enquiry.

I may point out in conclusion that in no photos that have yet been obtained do we get anything like the ridiculous conventional zigzags which artists represent in their pictures.

SYNOPSIS.

1. Epitomised report of Thunderstorm Committee of Meteorological Society of London on certain sixty lightning photos and their opinion that lightning tends to assume various forms under conditions at present unknown.

2. That the Meteorological Society have overlooked the modifying influence of cloud in obstructing and absorbing parts of flash, although it explains most simply one matter that puzzled them.

3. Enquiry whether the modifying influence of cloud cannot also explain the various forms which the Meteorological Society has classified.

4. The greater probability that lightning assumes only certain forms which can be obtained under simple conditions in the laboratory in contradistinction to the view put forward by the Meteorological Society of London.